

# Drilling and the DEC: Responding to New Guidelines



Anthony R. Ingraffea Ph.D., P.E.  
*Physicians, Scientists, and Engineers for  
Sustainable and Healthy Energy, Inc.*

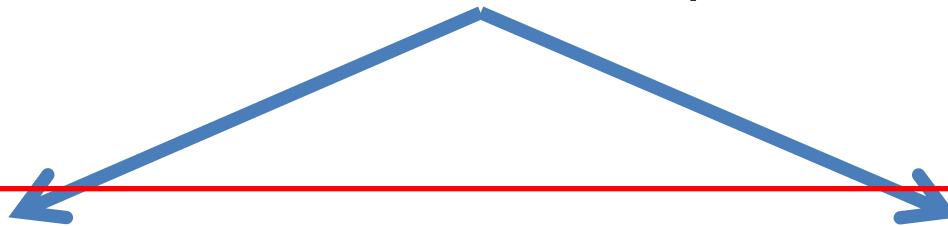
*Ithaca, NY  
July 25, 2011*

# Purpose of An Environmental Impact Statement

Identify Potential Impacts



Assess Identified Impacts



Propose  
Mitigation of  
Identified Impacts

Propose  
Prohibition of  
Identified Impacts

“The DEC proposes to require, via **permit condition and/or regulation**, that for High Volume Hydraulic Fracturing (HVHF).....

# Focus Tonight on Only Two Potential Impacts and Proposed Actions

Emission of gases with Global Warming 6.6  
Potential due to natural gas well drilling and  
production.

Contamination of groundwater/aquifers from 6.1.4  
natural gas, drilling fluids, or HVHF fluids in  
the wellbore.

See Table 11.1 for Roadmap to Impacts and Proposed Actions

## 6.6 Greenhouse Gas Emissions: GWP Factors And Time Horizon

*“Chesapeake Energy Corporation’s July 2009 Fact Sheet on gas emissions states that CO<sub>2</sub> has a GWP of 1 and CH<sub>4</sub> has a GWP of 23, and that this comparison allows emissions of greenhouse gases to be estimated and reported on an equal basis as CO<sub>2</sub>e. However, GWP factors are continually being updated, and for the purpose of this analysis as required by the Department’s 2009 Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement, the 100-Year GWP factors... were used to determine total GHGs as CO<sub>2</sub>e.”*

Page 6-197

## 6.6 Greenhouse Gas Emissions: GWP Factors And Time Horizon

Table 6.15 - Global Warming Potential for Given Time Horizon<sup>122</sup>

Common Name	Chemical Formula	20-Year GWP	100-Year GWP	500-Year GWP
Carbon dioxide	CO <sub>2</sub>	1	1	1
Methane	CH <sub>4</sub>	72	25	7.6

SGEIS ignores much more recent research on GWP's and difference between HVHF and wells in methane emissions, e.g. Howarth *et al.* 2011, wherein **100 Year GWP of CH<sub>4</sub> is 33 and 20 Year GWP is 105**

Table 6.16 - Summary of Estimated Greenhouse Gas Emissions (Revised July 2011)

	CO <sub>2</sub> (tons)	CH <sub>4</sub> (tons)	CH <sub>4</sub> Expressed as CO <sub>2</sub> e (tons) <sup>123</sup>	Total Emissions from Proposed Activity CO <sub>2</sub> e (tons)
Estimated First-Year Green House Gas Emissions from Single Vertical Well	8,660	246	6,150	14,810
Estimated First-Year Green House Gas Emissions from Single Horizontal Well	8,761	240	6,000	14,761
Estimated Post First-Year Annual Green House Gas Emissions from Single Horizontal Well	6,164	244	6,100	12,264
Estimated First-Year Green House Gas Emissions from Four-Well Pad	13,901	402	10,050	23,951
Estimated Post First-Year Annual Green House Gas Emissions from Four-Well Project	6,183	565	14,125	20,300

# Marcellus Well Being “Finished” Outside Dimock, Pa June, 2011: Major Source of Methane Emission



Photo and FLIR Video Courtesy Frank Finan

# Compressor Station in PA Under Standard and Infrared Photography: Major Source of Methane Emission as GHG



Video Courtesy of the CHESEPEAKE BAY FOUNDATION

# Bubbling in Muncy Creek, Lycoming County, PA: Example of Migration of Methane as GHG



Video Courtesy of Ralph Kisberg, Responsible Drilling Alliance

# Identification of Impact and Proposed Mitigations: Table 11.1

Greenhouse Gas Emissions	Emission of gases with Global Warming Potential due to natural gas well drilling and production.	6.6
--------------------------	--	-----

Requires development of a GHG emissions impacts mitigation plan, requires development of a leak detection and repair program, and encourages participation in the USEPA's Natural Gas STAR program. Requires reduced emission completions where a pipeline is available.

# Identification of Impact and Proposed Mitigations

Contamination of groundwater/aquifers from natural gas, drilling fluids, or HVHF fluids in the wellbore. 6.1.4

Specifies permit conditions for more stringent casing construction and cementing, reporting of well information, and testing of cement job for HVHF wells. 7.1.4.2

# Methane Migration to Well Head, Dimock, PA: Major Source of Methane Emission and Indication of Possible Water Well Contamination



# The “New” Intermediate Casing Myth



New York State Department of Environmental Conservation

Andrew M. Cuomo, Governor

Joe Martens, Commissioner

NYS DEC  
625 Broadway  
Albany, NY 12233-1016  
[www.dec.ny.gov](http://www.dec.ny.gov)

---

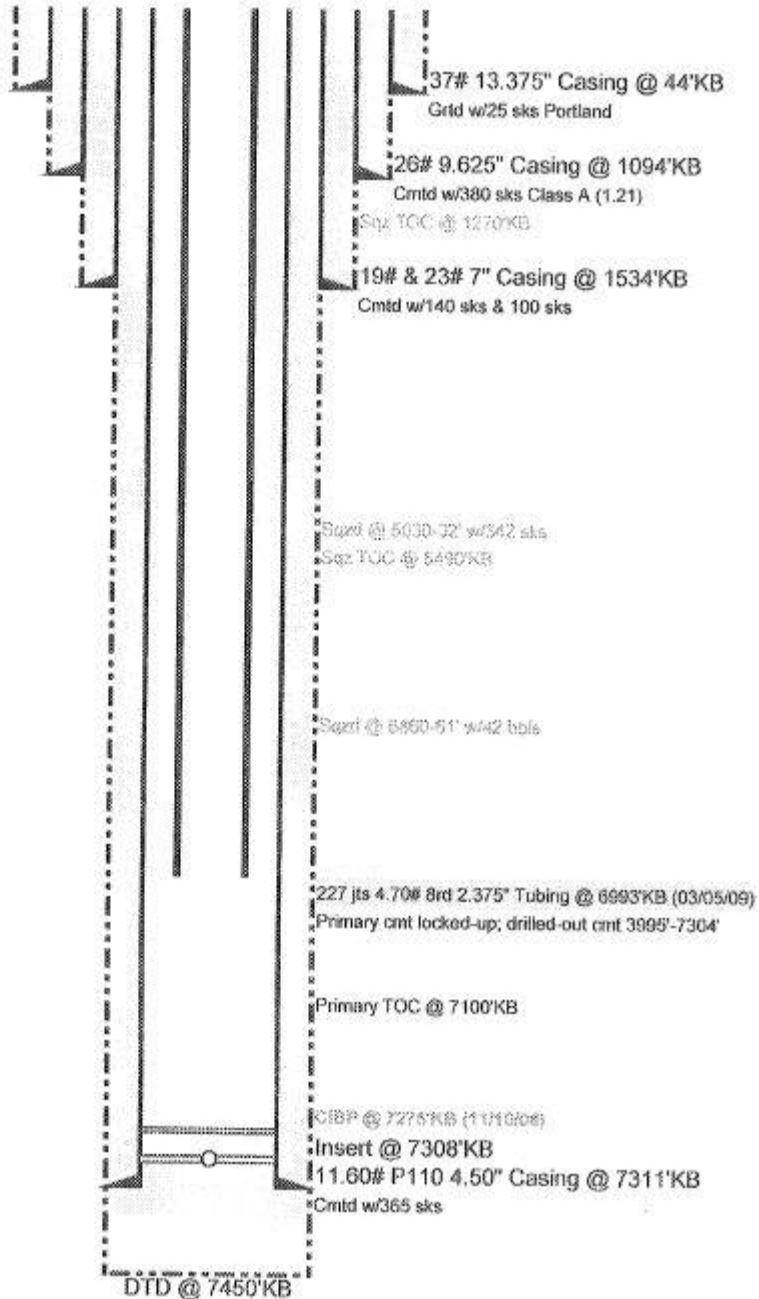
## FACT SHEET: 2011 RECOMMENDATIONS FOR PERMITTING HIGH-VOLUME HYDRAULIC FRACTURING IN NEW YORK STATE

**Additional Well Casing to Prevent Gas Migration:** In most cases, an additional third, cemented well casing is required around each well to prevent the migration of gas. The three required casings are the surface casing, the new intermediate casing and the production casing. The depths of both surface and intermediate casings will be determined by site-specific conditions.

Elevation: 1545'

FW @ 990'

SW @ 2300'

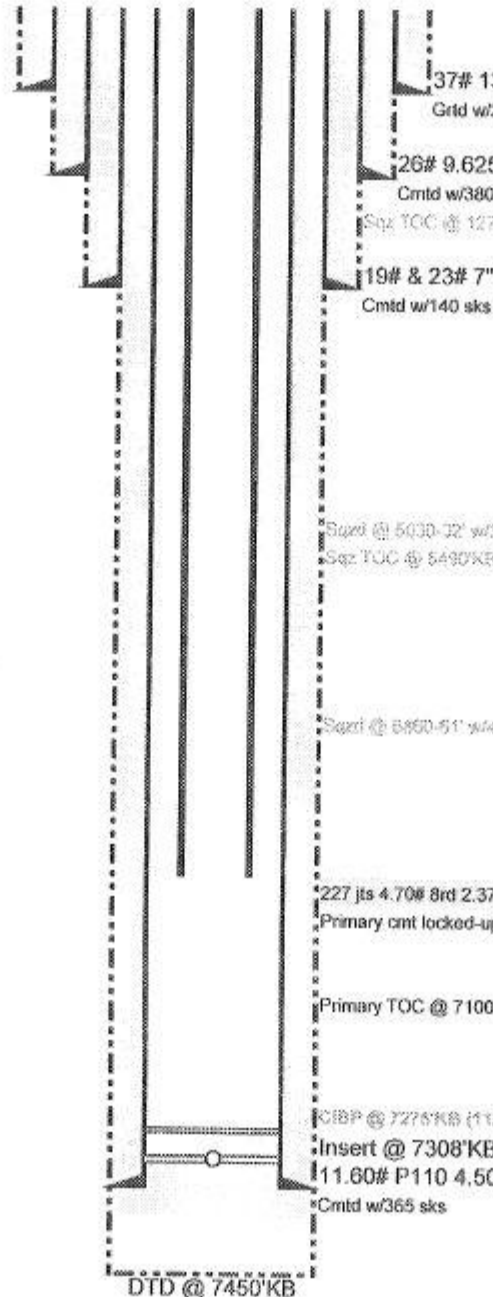


## As-Built Casing Layouts for 2 PA Marcellus Wells That Contaminated Water Wells

Elevation: 1545'

FW @ 990'

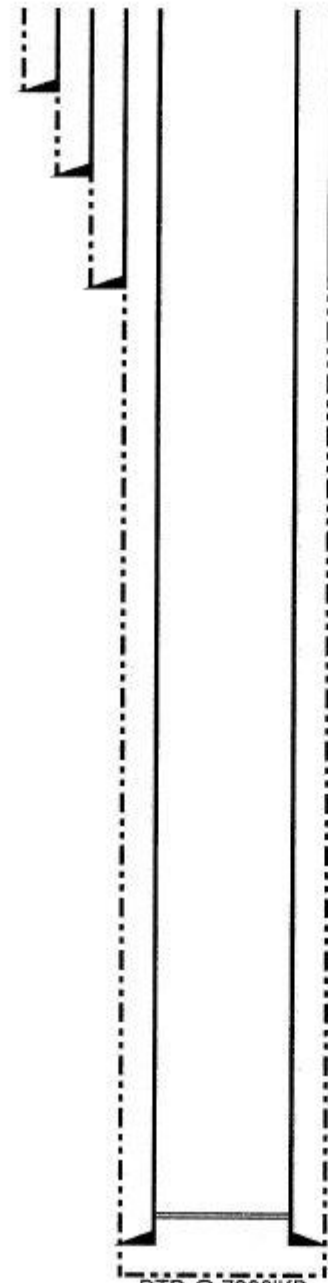
SW @ 2300'



Elevation: 1070'

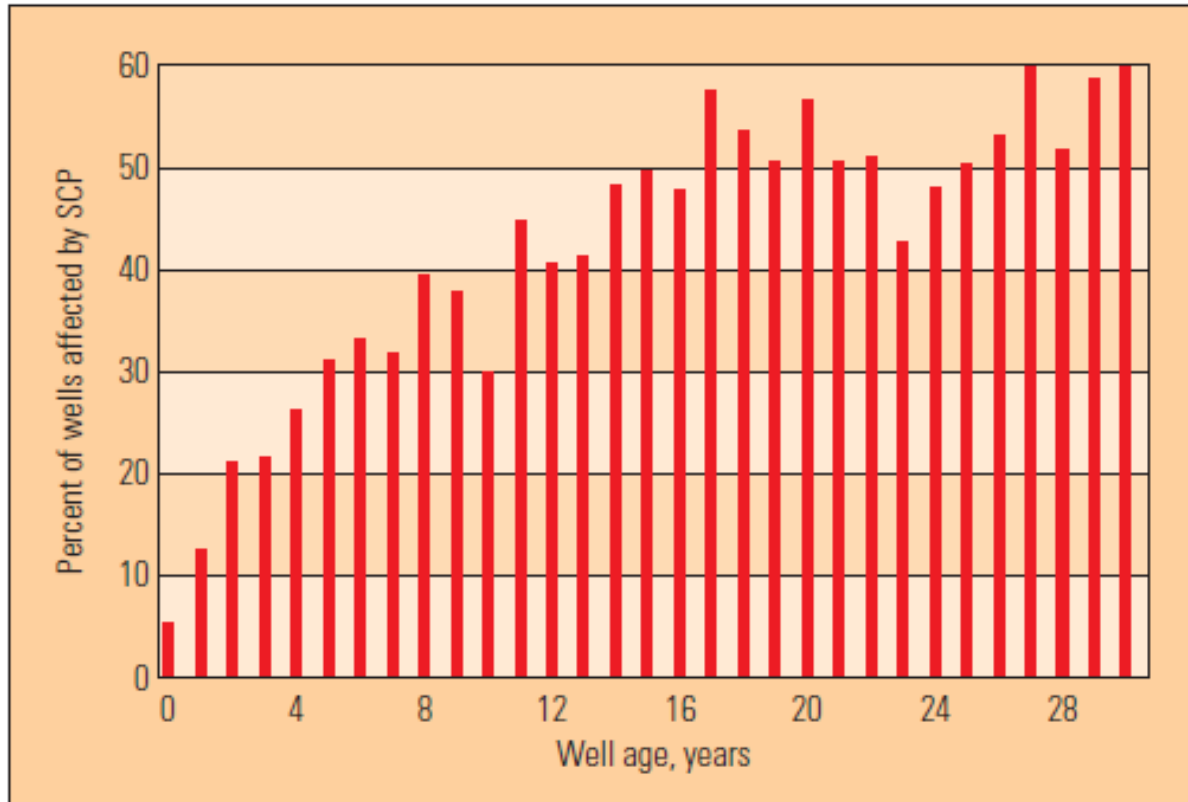
FW @ 80', 740'

SW--none reported



Insert @ 7074'KB  
 Casing @ 11.60# P110 4.50\"/>

# Sustained Casing Pressure and Gas Migration Are Chronic Problems



^ Wells with SCP by age. Statistics from the United States Mineral Management Service (MMS) show the percentage of wells with SCP for wells in the outer continental shelf (OCS) area of the Gulf of Mexico, grouped by age of the wells. These data do not include wells in state waters or land locations.

Brufatto *et al.*, Schlumberger OilField Review, Autumn, 2003.

# Sustained Casing Pressure and Gas Migration Are Chronic Problems

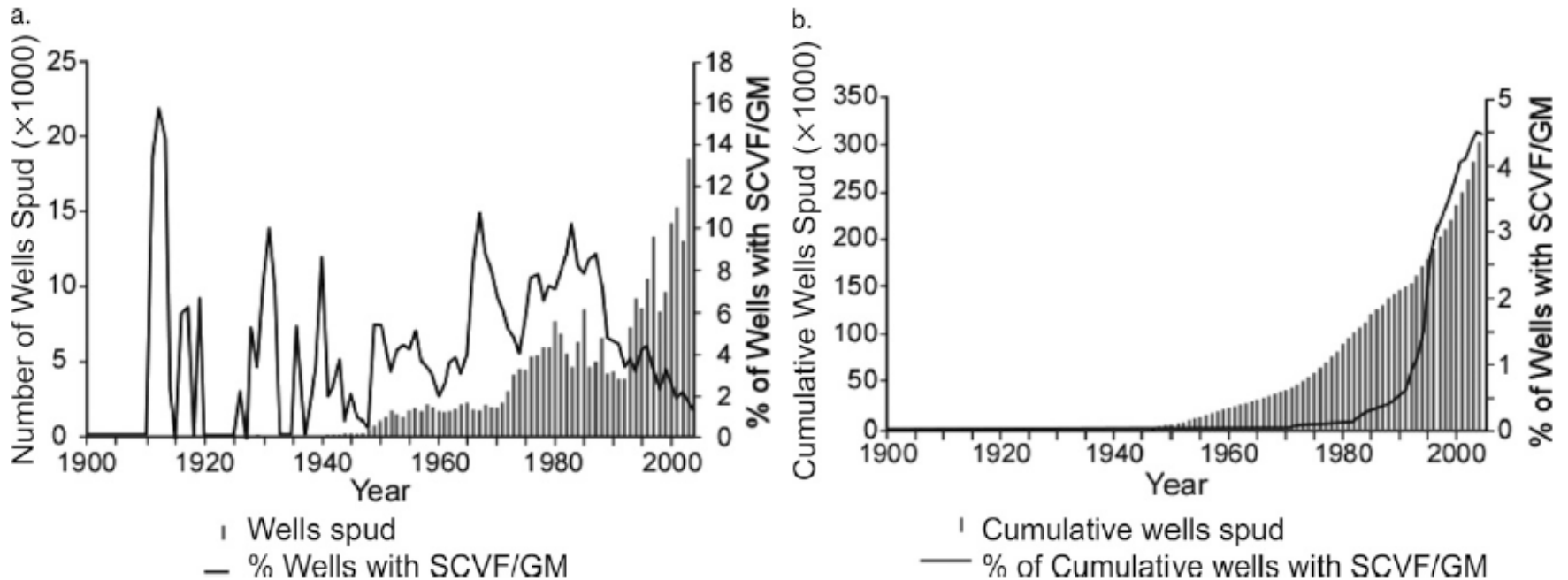


Fig. 8—Historical levels of drilling activity and SCVF/GM occurrence in Alberta: (a) by year of well spud and (b) by cumulative wells drilled.

Watson and Bachu, SPE 106817, 2009.



New York State Department of Environmental Conservation

Andrew M. Cuomo, Governor

Joe Martens, Commissioner

NYS DEC  
625 Broadway  
Albany, NY 12233-1016  
[www.dec.ny.gov](http://www.dec.ny.gov)

## **FACT SHEET: WHAT WE LEARNED FROM PENNSYLVANIA**

In June, DEC Commissioner Joe Martens and five senior DEC staff members visited LeRoy Township in Bradford County, Pennsylvania to learn what went wrong at a well site allowing the release of high-volume hydraulic fracturing fluids. Commissioner Martens met with Pennsylvania Department of Environmental Protection officials and natural gas company representatives so that their experiences could help inform New York's 2011 Supplemental Generic Environmental Impact Statement process.

DEC did not restrict its review to that one incident. DEC staff studied incidents throughout Pennsylvania where problems occurred to assess their causes and identify solutions.

# What DEC Did NOT Report from What Was Learned in PA

The suggested, required addition of an INTERMEDIATE, “PROTECTIVE” layer of casing, does NOT prevent methane or other fluid migration.

The SGEIS **does not contain a statistical analysis** from the experience of 3500+ PA Marcellus wells of:

- Incidents of fluid migration. e.g. # of confirmed well water contaminations
- Incidents of blowouts, pipeline failures, pad fires, etc.
- Methane emissions, vented and fugitive
- Flowback, “produced water”, and brine waste volumes
- Liquid and solid waste final disposition
- Citations and enforcements

**Thank You for Attending  
and Participating Tonight**